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BROWDY AND NEIMARK, P.L.L.C.
624 NINTH STREET, NW
SUITE 300
WASHINGTON, DC 20001-5303

EXAMINER	
RUTTEN, JAMES D	

ART UNIT	PAPER NUMBER
2192	

DATE MAILED: 06/06/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/003,482	UR ET AL.	
	Examiner	Art Unit	
	J. Derek Rutten	2192	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2005*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-11,13-30 and 32-42* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-11,13-30 and 32-42* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *06 December 2001* is/are: a)☐ accepted or b)☒ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

1. Acknowledgement is made of Applicant's amendment dated 3 March 2005, responding to the 6 December 2004 Office action provided in the rejection of claims 1-40, wherein claims 1, 17, and 37-40 have been amended, claims 12 and 31 have been canceled, and new claims 41 and 42 have been added. Claims 1-42 remain pending in the application and have been fully considered by the examiner.

2. Applicant has primarily argued that the claims are not anticipated by the IBM reference because it does not disclose evaluation of coverability. This argument is not persuasive, as will be addressed under the *Response to Arguments* section below.

3. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Response to Arguments

4. In the second paragraph on page 23 of applicant's response, applicant essentially argues that the IBM reference does not disclose evaluating attained and unattained coverability. However, the coverability tool is designed for this very purpose. The very first line of the disclosure discusses using coverability metrics for the purpose of analysis:

> Disclosed is a new testing concept – coverability analysis – and it is shown how a number of coverability metrics, corresponding to some commonly-used coverage metrics (statement, multi-condition), can be implemented via Symbolic Model Checking (1).

Further on page 1:

> A coverability model is defined by creating, for every coverage event indicator in coverage model, a coverability event indicator which is binary function on the state-machine model. The coverability event indicator is true if there exists a test on the state-machine model for which the corresponding coverage event indicator is true.

And further on page 2:

> The analysis is carried out by formulating special rules on the instrumented model, and presenting these rules (with the instrumented model) to a Symbolic Model Checker.

These passages show that rules are presented to a symbolic model checker, and an indicator function returns true or false depending on the return value of the binary function. In other words, an evaluation is made by the symbolic model checker to determine whether coverability has been attained or if coverability is unattained.

In the third paragraph on page 23, applicant essentially argues that IBM does not teach performing a comparison between the attained coverability and the coverability tasks. This argument is convincing

5. Applicant's arguments in the third paragraph on page 23 with respect to "comparing the attained coverability" in claims 1, 17, and 37-40 have been considered but are moot in view of the new ground(s) of rejection necessitated by the amendment.

Drawings

6. The drawings are objected to under 37 CFR 1.83(a). The drawings must show every feature of the invention specified in the claims. Therefore, the generation of rules less than or equal to a number of basic blocks wherein the number of rules is a function of a control-flow structure (claims 41 and 42) must be shown or the feature(s) canceled from the claim(s). No new matter should be entered.

Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

Claim Rejections - 35 USC § 103

7. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

8. Claims 1-10, 13-28, 30, 32-36 are rejected under 35 U.S.C. 103(a) as being unpatentable over "Coverability Analysis Using Symbolic Model Checking" published by IBM (hereinafter "IBM") in view of the "Background of the Invention" section found on pages 1-13 of the originally filed specification (hereinafter "BOTI").

In regard to claim 1, IBM discloses:

A method for performing coverability analysis in software, See IBM page 1:

> Every coverage model has a corresponding **coverability model**. A coverability model is defined by creating, for every coverage event indicator in coverage model, a coverability event indicator which is binary function on the state-machine model. The coverability event indicator is true if there exists a test on the state-machine model for which the corresponding coverage event indicator is true.

comprising:

formulating respective coverability tasks for the dominating blocks of the SUT; See IBM bottom of page 1:

> First, as described above, a coverage model is in fact composed of coverage event indicators, each of which is **mappable to a corresponding coverability indicator.**

generating rules regarding behavior of the SUT corresponding respectively to the coverability tasks; See IBM bottom of page 1 – top of page 2:

> The second observation is that a state-machine model can be instrumented with control variables and related transitions which, on one hand, retain the original model behavior as

> reflected on the original state variables, and, on the other hand, can be used for coverability analysis of the model. The analysis is carried out by **formulating special rules** on the instrumented model, and presenting these rules (with the instrumented model) to a Symbolic Model Checker.

for each of the rules, running a symbolic model checker to test a behavioral model of the SUT, so as to produce respective results for the rules; See IBM top of page 2 as cited above:

> The analysis is carried out by formulating special rules on the instrumented model, and **presenting these rules (with the instrumented model) to a Symbolic Model Checker**.

and

computing a coverability metric for the SUT responsive to the results and the coverability tasks. See IBM top of page 1:

> ...it is shown how a number of **coverability metrics**, corresponding to some commonly-used coverage metrics (statement, multi-condition), **can be implemented** via Symbolic Model Checking (1).

wherein computing the coverability metric comprises:

evaluating an attained coverability responsive to the respective results produced by running the symbolic model checker; evaluating an unattained coverability responsive to the respective results produced by running the symbolic model checker; See page 1:

> A coverability model is defined by creating, for every coverage event indicator in coverage model, a coverability event indicator which is binary function on the state-machine model. The coverability event indicator is true if there exists a test on the state-machine model for which the corresponding coverage event indicator is true.

And further on page 2:

> The analysis is carried out by formulating special rules on the instrumented model, and presenting these rules (with the instrumented model) to a Symbolic Model Checker.

These passages show that rules are presented to a symbolic model checker, and an indicator function returns true or false depending on the return value of the binary

function. In other words, an evaluation is made by the symbolic model checker to determine whether coverability has been attained or if coverability is unattained.

IBM does not expressly disclose *performing a static analysis of software under test (SUT) so as to identify a plurality of dominating blocks in the SUT,* comparison of attained coverability and coverability tasks, calculation based on the comparison, or analyzing the model based on unattained coverability.

However, in an analogous environment, BOTI teaches:

performing a static analysis of software under test (SUT) so as to identify a plurality of dominating blocks in the SUT (BOTI: page 11 line 11 – page 12 line6:

> As noted earlier, **some optimizations in model checking borrow concepts from compiler theory**. These concepts are known in the art, and include a basic block--a set of one or more statements within the same control-flow construct. Another useful, related concept is that of **dominating blocks**, including pre-dominating and post-dominating blocks.

Also Fig. 4 and associated text on page 12 lines 17-29 teaches dominating blocks.

performing a comparison between the attained coverability and the coverability tasks; See BOTI page 3 lines 14-15:

> The oracle function performs a comparison step 34 between actual results of execution 24 and expected results 32...

calculating the coverability metric responsive to the comparison; See page 3 lines 16-17:

> ...and condition 36 determines the success or failure of the test.

analyzing the behavioral model of the SUT with respect to the unattained coverability. See page 3 lines 17-19:

> An outcome of failure generally indicates a defect in SUT 10, which requires developer attention in a debug step 38.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of software test procedures with IBM's coverability tool. One of ordinary skill would have been motivated to analyze source code to identify dominating blocks in order to perform computational optimizations to reduce the amount of time spent analyzing a model. Further, one would be motivated to compute a relative success or failure of a test in order to determine whether further analysis is necessary.

In regard to claim 2, the above rejection of claim 1 is incorporated. IBM does not expressly disclose: *writing the SUT in a programming language adapted to define at least one of a group of elements comprising a software element and a hardware element.* However, BOTI teaches on page 4 lines 25-29 of the originally filed specification of the incorporated reference "Symbolic Model Checking without BDDs" by Biere et al. (hereinafter "Biere"). Further review of Biere reveals the use of the "SMV language" in Section 6. This leads to the reference "Symbolic Model Checking" by McMillan (hereinafter "McMillan") which defines the SMV language in Chapter 3. Since the SMV language is implemented as a software programming language, it inherently provides for software elements. McMillan then goes on to use the software elements in terms of hardware in Chapter 4. As such, it also defines hardware elements. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of SMV with IBM's model checker. One of ordinary skill would have

been motivated to provide a symbolic description of the transition relation of a finite Kripke structure in order to provide a great deal of flexibility.

In regard to claim 3, the above rejection of claim 1 is incorporated. IBM does not expressly disclose: *wherein performing the static analysis of the SUT comprises: identifying a set of dominating blocks in the SUT; and solving a subset cover problem on the set of dominating blocks so as to identify the plurality of dominating blocks.* However, BOTI teaches solving a subset cover problem on page 13 lines 3-11. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of a subset cover problem with IBM's model checker. One of ordinary skill would have been motivated to use an efficient algorithm that solves the subset cover problem in order to save execution time.

In regard to claim 4, the above rejection of claim 3 is incorporated. IBM does not expressly disclose: *wherein the set of dominating blocks comprises a set of all dominating blocks in the SUT, and wherein the plurality of dominating blocks comprises fewer blocks than the set of all dominating blocks in the SUT.* However, BOTI teaches a subset of dominating blocks on page 13 line 5. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of a subset of dominating blocks with IBM's model checker. One of ordinary skill would have been motivated to reduce the computation space in order to reduce execution time.

In regard to claim 5, the above rejection of claim 4 is incorporated. IBM does not expressly disclose: *wherein running the symbolic model checker comprises performing a number of executions of the symbolic model checker smaller than a total number of all the dominating blocks in the SUT.* However, by the definition and example given in BOTI page 13 lines 17-21, the Greedy Algorithm "selects a block with the largest set of dominated blocks, constructs a list of covered blocks, and repeats until the list of covered blocks contains each block in the SUT." This results in a smaller number of "executions" than blocks. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of the Greedy Algorithm with IBM's model checker. One of ordinary skill would have been motivated to reduce the computation space in order to reduce execution time.

In regard to claim 6, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein formulating the respective coverability tasks for the dominating blocks of the SUT comprises formulating coverability tasks by at least one of a group of methods comprising manual formulation and automatic formulation.* See IBM: "mappable to a corresponding coverability indicator." Mapping must be either manual or automatic, there are no there options.

In regard to claim 7, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein generating the rules regarding behavior of the SUT comprises generating rules by at least one of a group of methods comprising manual generation and*

automatic generation. See IBM: "formulating special rules on the instrumented model...". Formulation must be either manual or automatic, there are no other options.

In regard to claim 8, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein running the symbolic model checker to test the behavioral model of the SUT comprises: evaluating the respective results so as to determine the truth or falsity of the rule; and generating a list of uncoverable elements responsive to the respective results.* See IBM: "The coverability event indicator is true if there exists a test on the state-machine model for which the corresponding coverage event indicator is true.

In regard to claim 9, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein generating the rules regarding behavior of the SUT corresponding respectively to the coverability tasks comprises instrumenting the SUT by adding one or more statements and one or more auxiliary variables thereto, so as to facilitate evaluation of the rules.* IBM page 2: "formulating special rules on the instrumented model"; also "adding a counter after every statement and initializing it to zero."

In regard to claim 10, the above rejection of claim 9 is incorporated. IBM further discloses: *wherein instrumenting the SUT comprises: determining a plurality of basic blocks comprised in the SUT; and for each basic block: defining an auxiliary variable for the block; initializing the auxiliary variable to zero; and assigning the auxiliary variable*

a non-zero value upon execution of the basic block. IBM page 2: "initializing it to zero… some of the counters are modified".

In regard to claim 12, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein computing the coverability metric comprises: evaluating an attained coverability responsive to the respective results produced by running the symbolic model checker; evaluating an unattained coverability responsive to the respective results produced by running the symbolic model checker; performing a comparison between the attained coverability and the coverability tasks; calculating the coverability metric* c'd *responsive to the comparison; and analyzing the behavioral model of the SUT with respect to the unattained coverability.* IBM page 2: "… a warning on the existence of dead-code is created for every statement that cannot be reached." This implies evaluation of attained and unattained coverability. Also "Automatically determining which of the coverage event indicators correspond to coverable events." This requires comparison and analysis of the behavioral model, otherwise the model checker could not determine what corresponds to what.

In regard to claim 13, the above rejection of claim 1 is incorporated. IBM further discloses: *analyzing a design of the SUT, responsive to the coverability metric, for at least one of a group of properties comprising dead code, unattainable states, uncoverable statements, uncoverable states, unattainable transitions, unattainable variable values,*

and unreachable conditions. IBM page 2: "... a warning on the existence of **dead-code** is created for every statement that cannot be reached."

In regard to claim 14, IBM does not expressly disclose *applying a testing strategy chosen from one of a group of strategies comprising excluding uncoverable elements from coverage measurements, setting coverage goals responsive to the coverability metric, and determining a criterion for stopping testing responsive to the coverability metric.* However, BOTI teaches at least setting coverage goals on page 2 lines 3-29. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of coverage goals with IBM's coverability tool. One of ordinary skill would have been motivated to set coverage goals in order to attain a well-defined level of success.

In regard to claim 15, the above rejection of claim 14 is incorporated. IBM further discloses: *wherein the uncoverable elements comprise one or more elements chosen from a group of elements comprising uncoverable statements, uncoverable states, unattainable transitions, unattainable variable values, and unreachable conditions.* IBM page 1: "statement, multi-condition... define-use, mutation, and loop"; also page 2: "a warning on the existence of dead-code is created for every statement that cannot be reached."

In regard to claim 16, the above rejection of claim 1 is incorporated. IBM further discloses: *wherein formulating the respective coverability tasks for the dominating blocks of the SUT comprises: identifying a coverage model for the SUT; defining a coverability model for the SUT responsive to the coverage model; and generating the respective coverability tasks responsive to the coverability model.* IBM page 1: "a coverage model is in fact composed of coverage event indicators, each of which is mappable to a corresponding coverability indicator."

In regard to claim 17, IBM does not expressly disclose a second coverability task, an inflator, an inflated result, or evaluating a second coverability task responsive to the inflated result. However, BOTI teaches:

running a symbolic model checker comprising an inflator to test a behavioral model of the SUT responsive to the rule so as to produce an inflated result; See BOTI page 6 lines 26-29:

> Symbolic model checker system 56 contains an optional **inflator** 64 which expands the scope of the model checker output, as described in more detail below, with reference to FIG. 3

evaluating the second coverability task responsive to the inflated result. See BOTI page 7 lines 22-28:

> Inflator 64 provides a way to **include additional variables in the trace** in result 80, by generating plausible values for additional variables. Inflator 64 sets input variables to random values, and **computes values for additional values** based on the random input variables and the contents of the counter-example.

All further limitations have been addressed in the above rejection of claim 1.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of using an inflator with IBM's model checker. One of ordinary skill would have been motivated to introduce additional random variables into a system to overcome the variable space reduction introduced by the cone of influence optimization.

In regard to claim 18, the above rejection of claim 17 is incorporated. IBM does not expressly disclose: *wherein formulating the second coverability task comprises choosing a plurality of coverability tasks from a set of all coverability tasks for the SUT, and wherein evaluating the second coverability task comprises evaluating the plurality.* However, BOTI teaches on page 7 lines 25-28 that an inflator computes values based on random input variables and the contents of the counter-example. This result is fed back and executed until all coverable tasks have been examined. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of an inflator with IBM's model checker. One of ordinary skill would have been motivated to exhaust the computation space until all possible tasks have been evaluated.

In regard to claims 19, 21-28, 31-34, and 36, the above rejection of claim 17 is incorporated. All further limitations have been addressed in the above rejections of claims 3, 4, 5, 2, and 6-10, and 12-16, respectively.

In regard to claim 20, the above rejection of claim 19 is incorporated. IBM does not expressly disclose: *wherein selecting the first coverability task comprises: identifying a greatest-influence dominating block having a largest set of dominated blocks comprised in the plurality; and selecting the first coverability task responsive to the greatest-influence dominating block.* However, BOTI teaches the "Greedy Algorithm" on page 13 lines 17-21 for identifying optimal coverability tasks. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of the Greedy Algorithm with IBM's model checker. One of ordinary skill would have been motivated to reduce the computation space of the model in order to reduce execution time.

In regard to claim 30, the above rejection of 17 is incorporated. IBM does not expressly disclose: *wherein running the symbolic model checker comprises producing the inflated result regardless of the truth or falsity of the rule.* However, BOTI teaches inflation on page 7 lines 6-29, without regard to whether a rule is true or false. An inflator finds values outside of the cone of influence regardless of the value of any particular rule.

In regard to claim 35, the above rejection of claim 35 is incorporated. IBM does not expressly disclose: *performing a plurality of executions of an inflator program so as to produce a plurality of inflated results; and evaluating the second coverability task responsive to the plurality of inflated results.* However, BOTI teaches on page 7 lines

22-29 that an inflator is useful for obtaining a plurality of values outside the cone of influence. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use BOTI's teaching of inflators with IBM's model checker. One of ordinary skill would have been motivated to repeat the execution of an inflator in order to obtain additional results that lie outside the cone of influence.

9. Claims 11 and 29 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of IBM and BOTI as applied to claims 1 above, and further in view of U.S. Patent 5,579,515 to Hintz et al. (hereinafter "Hintz").

In regard to claim 11, the above rejection of claim 9 is incorporated. The combination of IBM and BOTI do not expressly disclose: *determining a plurality of basic blocks comprised in the SUT; defining a single auxiliary variable for the SUT; initializing the single auxiliary variable to zero; and assigning a unique non-zero value to the single auxiliary variable upon execution of each basic block.* However, in an analogous environment, Hintz teaches in column 3 lines 20-25 that a variable can be used to uniquely identify separate logical entities. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Hintz's teaching of unique non-zero entities in IBM's coverability tool. One of ordinary skill would have been motivated to uniquely identify an executed block in order to determine the coverage status of the block.

In regard to claim 29, the above rejection of claim 27 is incorporated. All further limitations have been addressed in the above rejection of claim 11.

10. Claims 37-40 are rejected under 35 U.S.C. 103(a) as being unpatentable over the combination of IBM and BOTI, and further in view of U.S. Patent 6,484,134 to Hoskote (hereinafter "Hoskote").

In regard to claims 37 and 38, IBM does not expressly disclose an apparatus. However, in an analogous environment, Hoskote teaches such an apparatus in Fig. 1 and column 3 lines 18-57. All further limitations have been addressed in the above rejection of claims 1 and 17, respectively.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Hoskote's apparatus with IBM's method. One of ordinary skill would have been motivated to implement a method on an apparatus that can efficiently carry out the method.

In regard to claims 39 and 40, IBM does not expressly disclose a computer software product. However, Hoskote teaches such a product in claim 3 lines 48-64. All further limitations have been addressed in the above rejection of claims 1 and 17, respectively.

It would have been obvious to one of ordinary skill in the art at the time the invention was made to use Hoskote's software product with IBM's method. One of

ordinary skill would have been motivated to store instructions for a method for easy distribution and archival.

11. Claims 41 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM and BOTI as applied to claims 1 and 17 above, and further in view of U.S. Patent 5,179,702 to Spix et al. (hereinafter "Spix").

In regard to claim 41, the above rejection of claim 1 is incorporated. IBM discloses generating rules for analysis of coverability metrics (see middle of page 2: "...a rule for every statement..."). However, IBM does not expressly disclose: *a number of rules less than or equal to a number of basic blocks in the SUT, and wherein the number of rules is a function of a control-flow structure of the SUT.* However, BOTI teaches the concept of basic blocks on pages 11 and 12 as cited in claim 1, and further that path coverage can test the control-flow structure of a SUT (See page 2 lines 7-14). However, BOTI does not expressly teach that control-flow is based on a number of basic blocks. In an analogous environment, Spix teaches that a control flow graph shows the flow of control between basic blocks in a program unit (see column 45 line 63 – column 46 line 2). Since control flow is based on basic blocks, and path coverage tests control flow, it would have been obvious to one of ordinary skill in the art at the time the invention was made to use Spix's teaching of basic blocks and control flow with BOTI's teaching of control-flow and path coverage with IBM's teaching of coverability rules. One of

ordinary skill would have been motivated to calculate the path coverability to determine if proper control-flow can be covered.

In regard to claim 42, the above rejection of claim 17 is incorporated. IBM discloses: *running the symbolic model checker comprises running the symbolic model checker responsive to each of the rules.* See middle of page 2: "These rules are executed on the Model Checker..." All further limitations have been addressed in the above rejection of claim 41.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to J. Derek Rutten whose telephone number is (571) 272-3703. The examiner can normally be reached on T-F 6:00 - 4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Tuan Q. Dam can be reached on (571) 272-3695. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

jdr

Chameli C. Das

CHAMELI C. DAS
PRIMARY EXAMINER

5/31/05